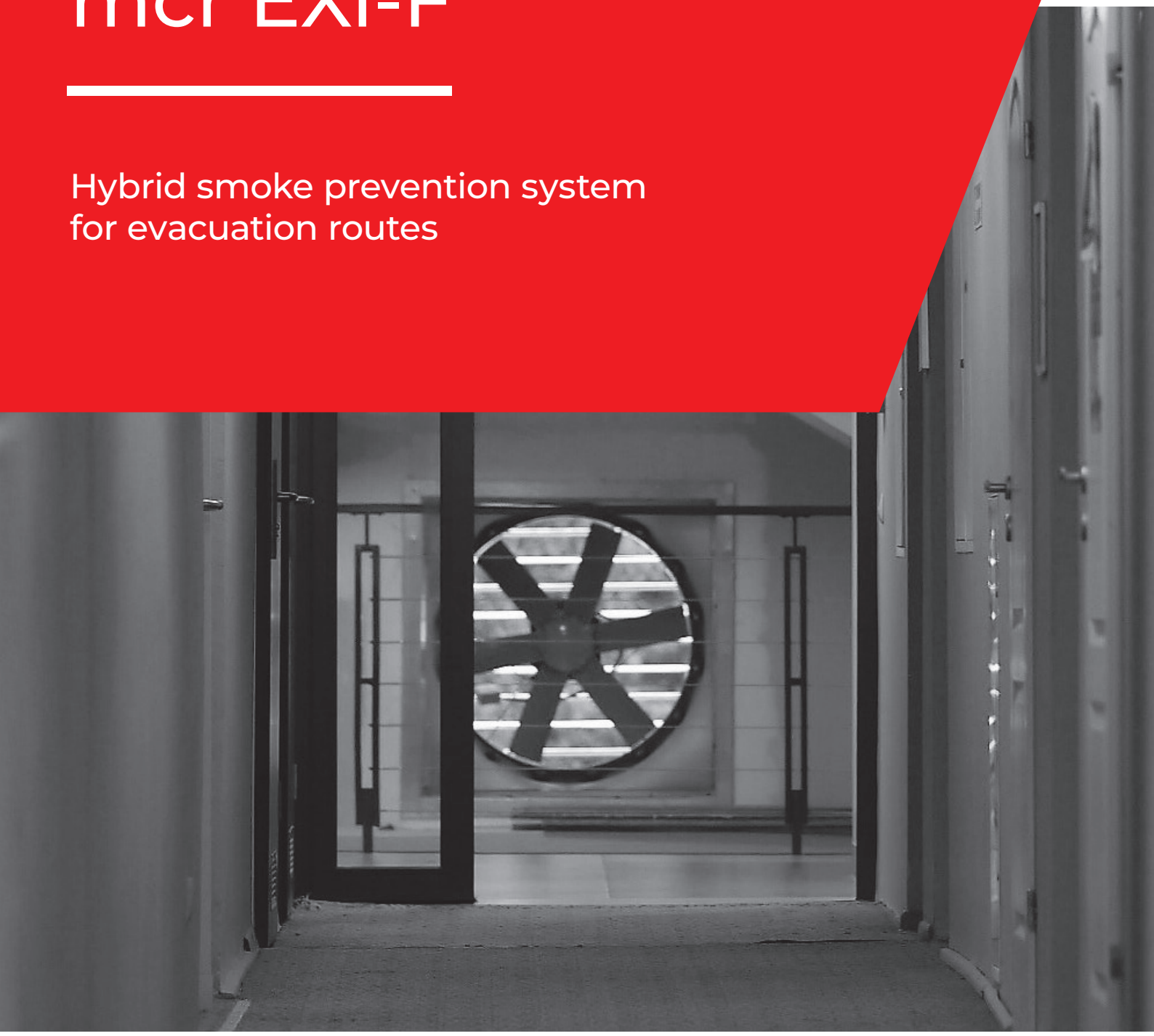
mercor group

# mcr EXi-F

## Hybrid smoke prevention system for evacuation routes



www.mercor.com.pl/en

www.facebook.com /grupamercor/

www.linkedin.com /company/mercorsa/

www.youtube.com /user/mercorsa

## Introduction

As many as 95% of fire fatalities are due to smoke poisoning, so the most important aspect of fire safety is the provision of fresh air on evacuation routes. Securing, for example, a staircase, often the only evacuation route, should consist in preventing smoke from entering it. Such possibilities are provided by using the mcr EXi-F product set for pressure differentiation.

## Experience

Over 20 years of experience gained by Mercor in the production of smoke prevention systems has allowed it to develop optimal solutions and constantly add new functionalities to its offer. The system is made up of appropriately configured device sets that cooperate and prevent the penetration of smoke into the protected space by creating higher overpressure. Device sets are appropriate for both indoor and outdoor operation, can also be used in a vertical or horizontal fan operating position, depending on the ordered version (installation on roofs, in walls etc.).

## Quality guarantee

When deciding on a solution, it is important to keep in mind that only certified systems, subjected to stringent dynamic tests in an accredited research body, are a guarantee of safe evacuation. The superior quality of our mcr EXi-F system is confirmed by:

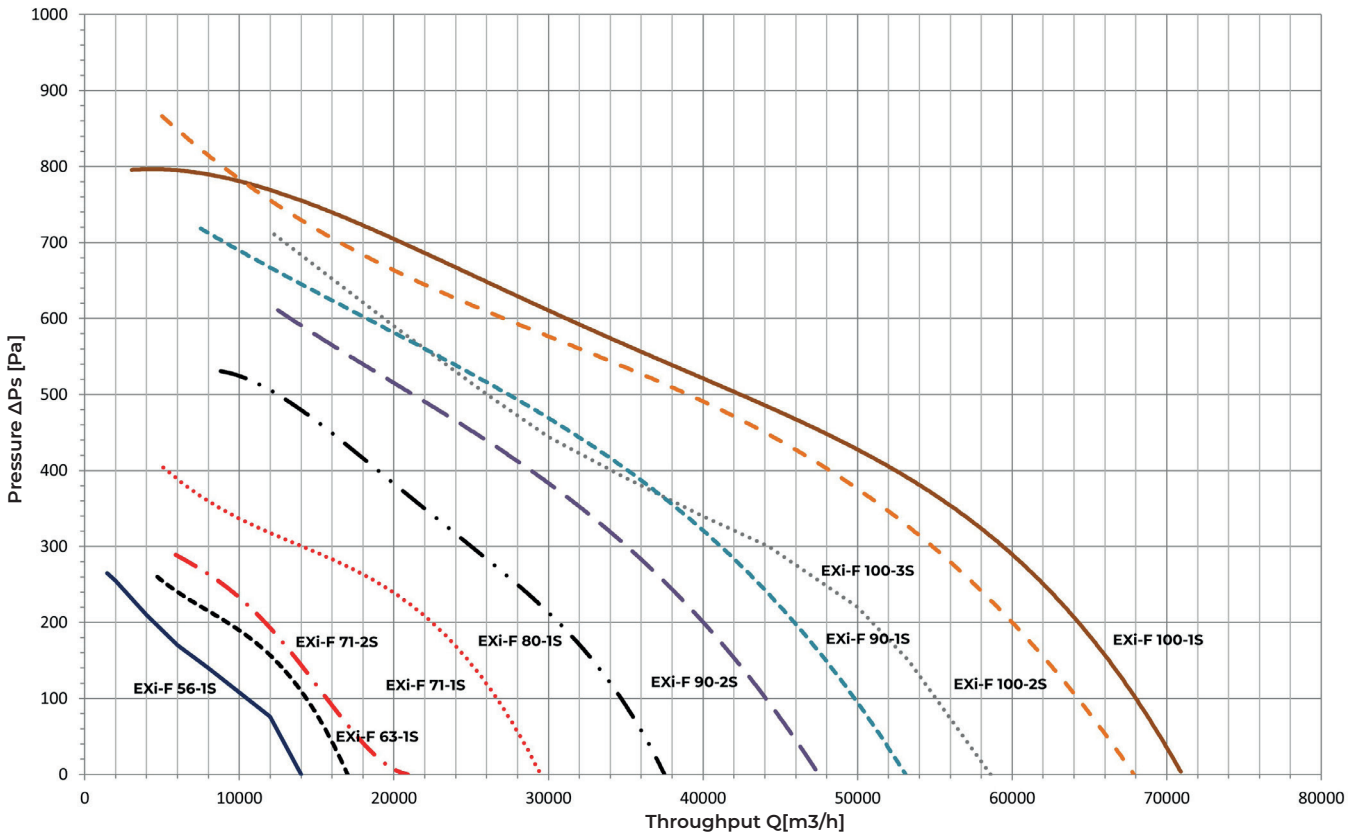
» National Technical Assessment ITB-KOT
» National Certificate of Constancy of Performance ITB
» Declaration of Conformity HW/02/2017
» Compliance with PN-EN 12101-6:2007
» Compliance with NFPA 92 (National Fire Protection Association — Standard for Smoke Control Systems)
» ITB Instructions No. 378/2002
» Compliance with EN 12101-13:2022
» Compliance with EN 12101-6:2022

# SERIES OF TYPES FOR THE UNITS

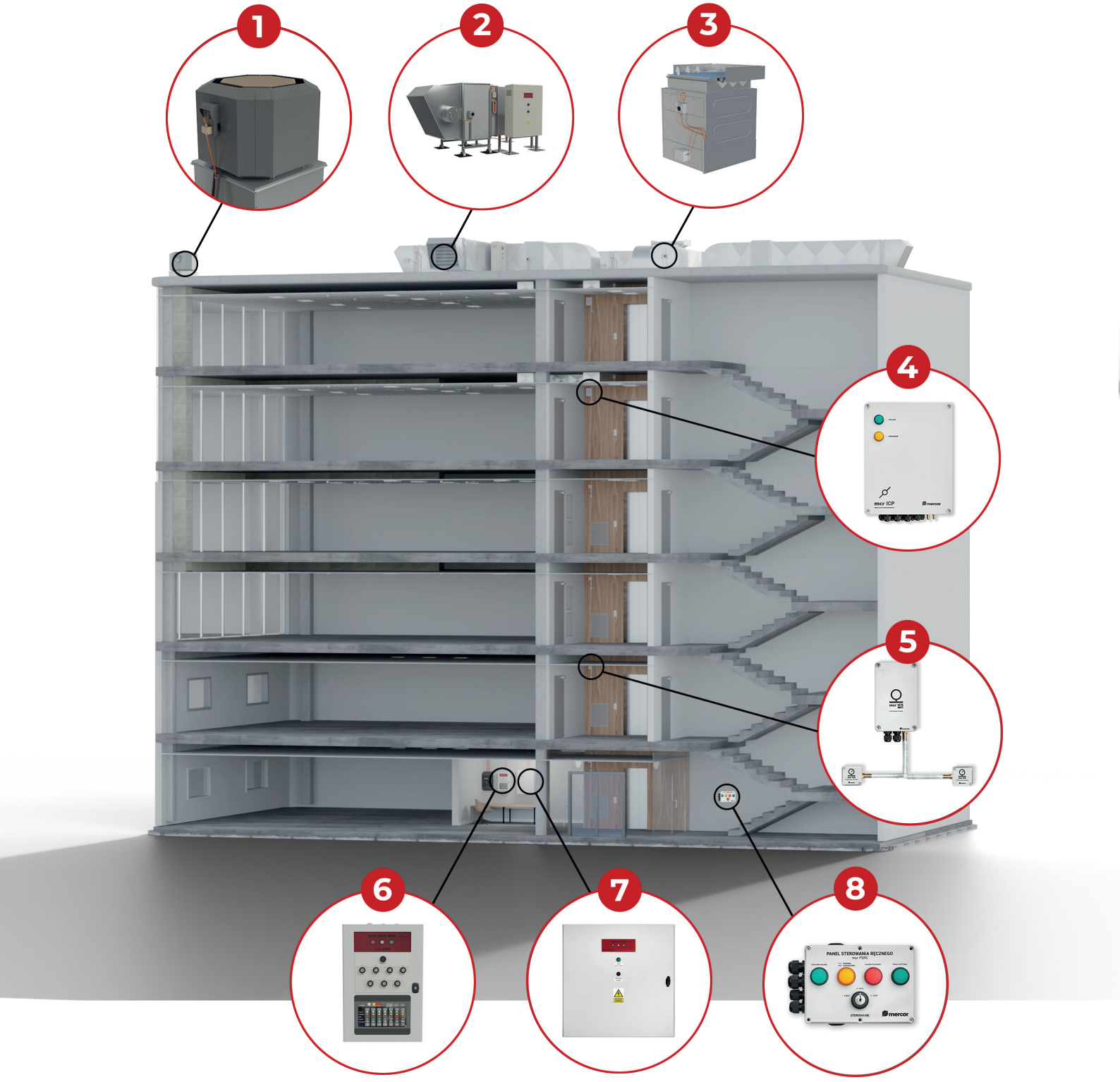
| Product type designation | mcr OMEGA control panel | Active power* | Nominal capacity | Static compression ratio | Weight | |
|---|---|---|---|---|---|---|
| | | | | | Horizontal configuration | Vertical configuration |
| | | [kW] | [m³/h] | [Pa] | [kg] | [kg] |
| mcr EXI-F 100-1S | 100,15 | 17,5 | 64 500 | 200 | 273 | 360 |
| mcr EXI-F 100-2S | 100,11 | 13,1 | 60 000 | 200 | 254 | 341 |
| mcr EXI-F 100-3S | 100,7 | 9,3 | 51 000 | 200 | 240 | 327 |
| mcr EXI-F 90-1S | 90,7 | 9,3 | 45 900 | 200 | 223 | 310 |
| mcr EXI-F 90-2S | 90,5 | 7 | 40 200 | 200 | 212 | 299 |
| mcr EXI-F 80-1S | 80,4 | 5,5 | 30 500 | 200 | 157 | 228 |
| mcr EXI-F 71-1S | 71,3 | 4,3 | 22 000 | 200 | 142 | 213 |
| mcr EXI-F 71-2S | 71,1 | 2,2 | 11 500 | 200 | 130 | 201 |
| mcr EXI-F 63-1S | 63,1 | 2,2 | 9 200 | 200 | 101 | 157 |
| mcr EXI-F 56-1S | 56,1 | 1,5 | 4 600 | 200 | 95 | 151 |

* installed power of the EXi-F unit devices

# UNIT CHARACTERISTICS



# EXAMPLES OF DEVICES ARRANGEMENT




1. Smoke exhaust fan – mcr PASAT or mcr MONSUN
2. mcr EXi-F air supply unit – horizontal version
3. mcr EXi-F air supply unit – vertical version
4. Lobby controller – mcr ICP
5. Differential pressure transmitter – mcr ICS Pro / mcr DES
6. Elevated control panel (visualization) – mcr WPS
7. Control panel – mcr Omega
8. Manual control panel–- mcr PSR, mcr PSRc

# SECURING VERTICAL EVACUATION ROUTES
# **STAIRCASES**

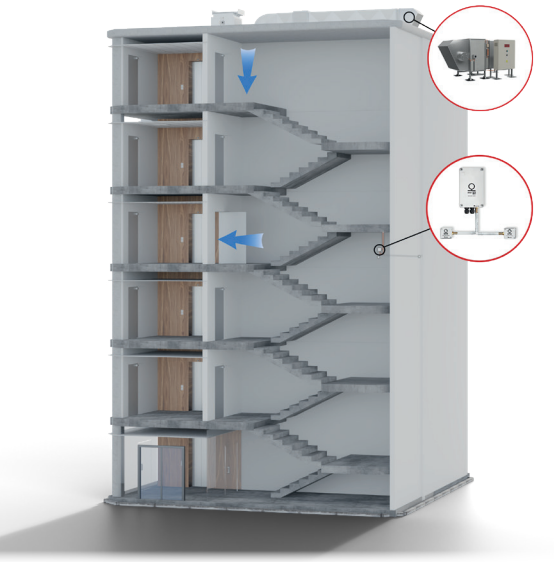


**Fig. 1:** In **low-rise buildings**, we use one mcr EXiF air supply unit along with one pressure sensor to protect staircases from smoke. An mcr PP pressure measurement point should be placed in the middle part of the staircase, avoiding the direct impact of the supplied air stream. The measurement reference point should be placed outside the building. The system operation is controlled by a dedicated mcr Omega control panel.

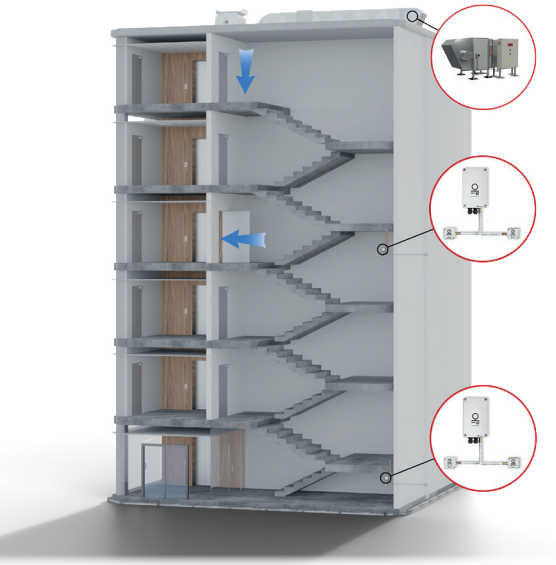


**Fig. 2:** In **tall buildings**, where the value of pressures in the lower and upper part of the staircase may be different, two pressure sensors should be used, together with one mcr EXi-F air supply unit. The algorithm implemented in the controller manages, through the actuators of the mcr Omega control panel, the speed of the air supply fan, controlling the average pressure value, as well as the minimum and maximum values that were determined during the system configuration.

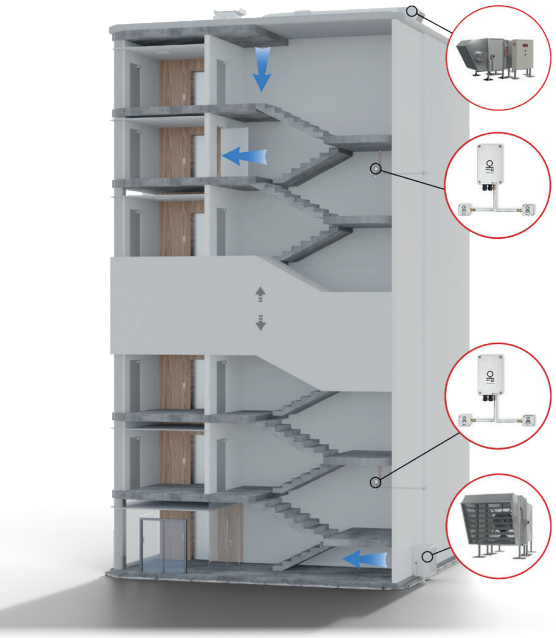


**Fig. 3:** In **tall and high-rise buildings**, where multi-point air supply using a duct is impossible, this requirement can be met by installing a sufficient number of air supply units. Each of the mcr EXi-F units protects a given staircase zone based on pressure readings from the differential pressure transmitter located in that zone. The system operation is controlled by dedicated mcr Omega control panels.

# SECURING VERTICAL EVACUATION ROUTES
## HIGH-RISE BUILDINGS – FLOW SYSTEM

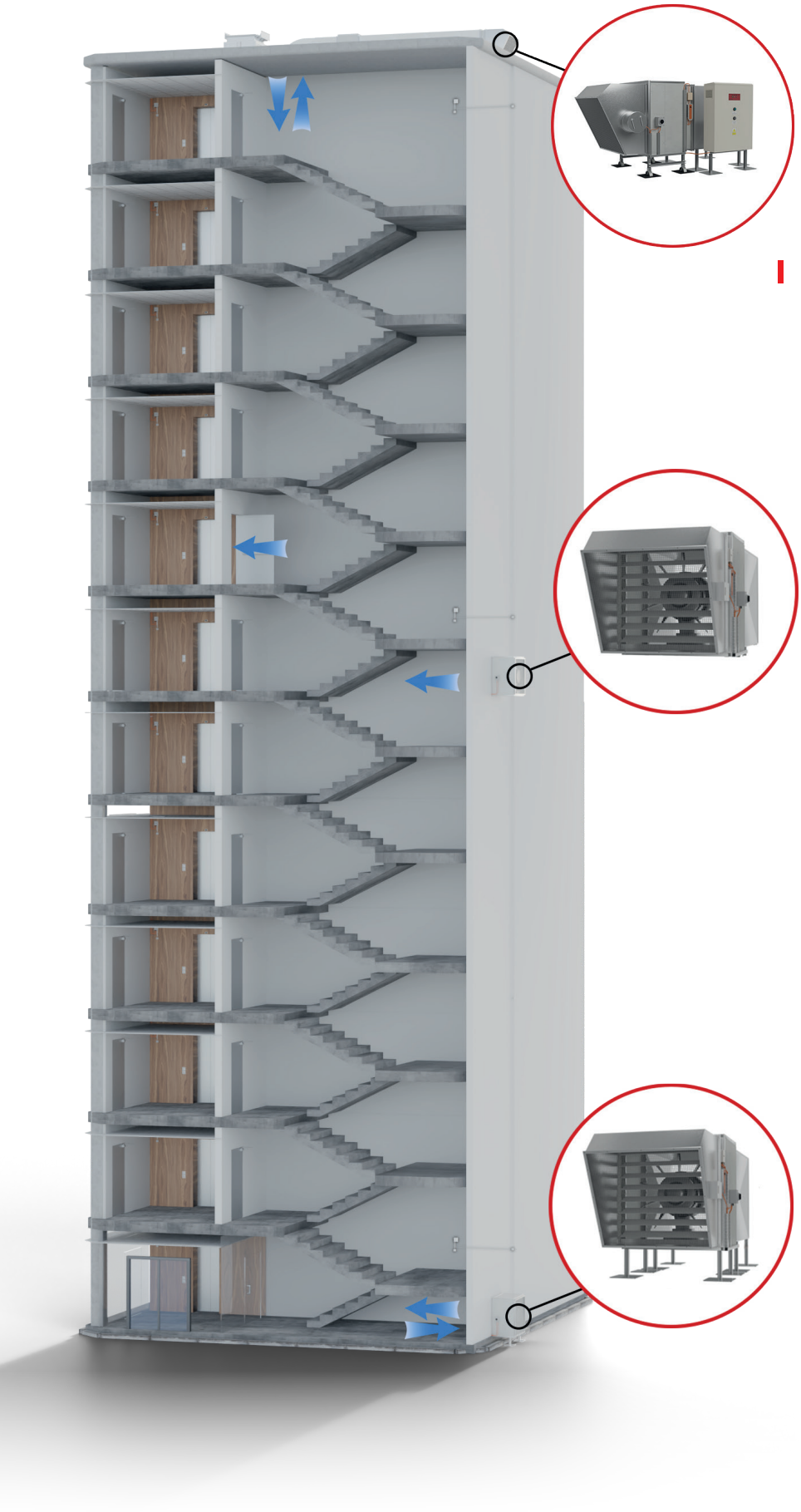


**Fig. 4:** In high-rise buildings, in order to achieve a stable pressure distribution in the protected space, air supply units with fans capable to operate in reverse mode can be used. The temperature measurement sensors used, depending on the implemented control algorithm, affect the change of performance and direction of rotation of the mcr EXi-F air supply fans, eliminating the impact of the stack effect. The system operation is controlled by dedicated mcr Omega control panels.

# SECURING VERTICAL EVACUATION ROUTES
## LIFTS

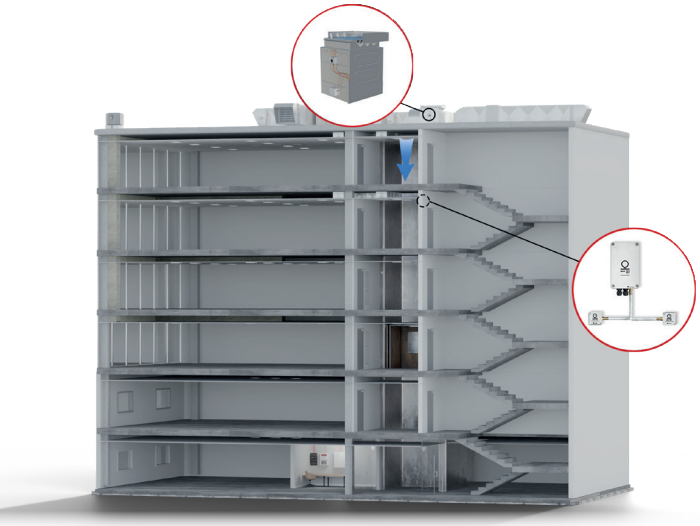


**Fig. 5: Passenger lifts.**
To protect passenger lifts from smoke, one air supply unit should be used, depending on the building height, with one or two pressure sensors. The system operation is controlled by a dedicated mcr Omega control panel.

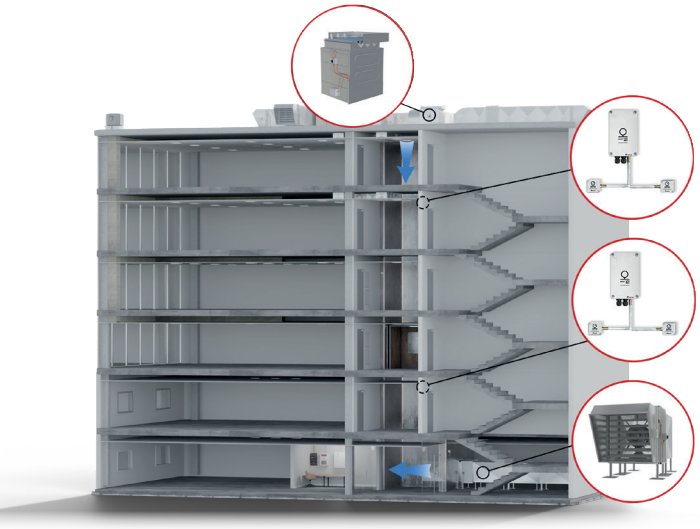


**Fig. 6: Fire lifts.**
To protect fire lifts from smoke, we recommend using two mcr EXI-F air supply units located in the lower and upper parts of the lift shaft. Each of the units operates at a variable rotational speed of the air supply fan based on pressure readings from two pressure sensors located in the lower and upper parts of the lift shaft. The system operation is controlled by dedicated mcr Omega control panels.

# SECURING HORIZONTAL ESCAPE ROUTES
## FIRE-FIGHTING LOBBIES

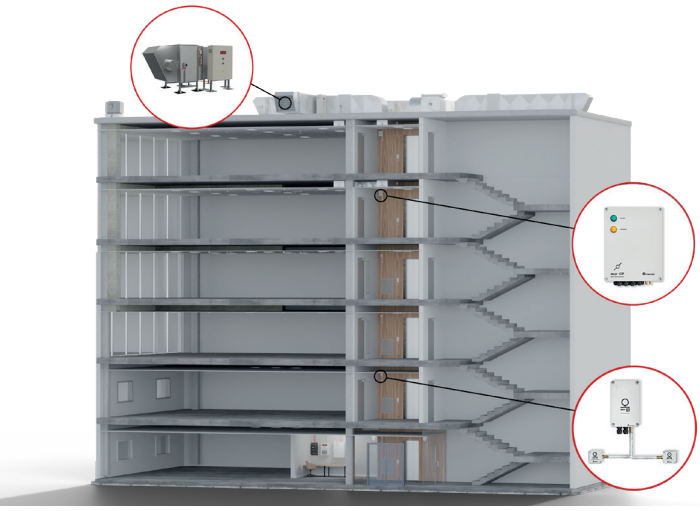
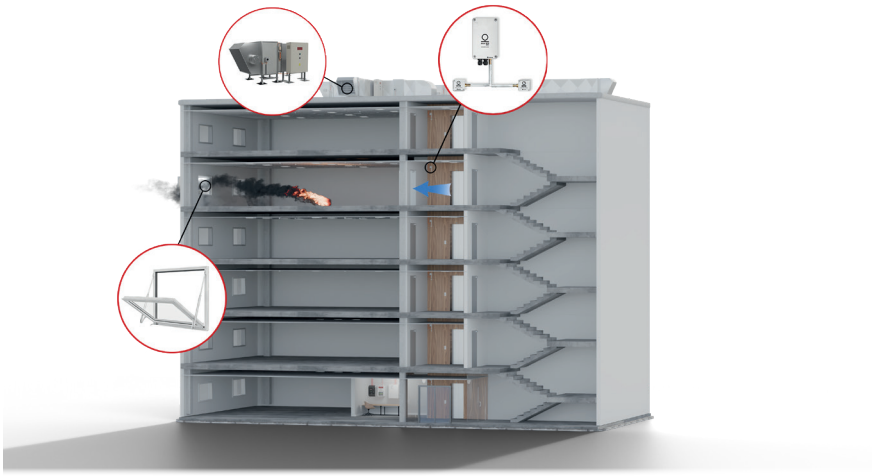


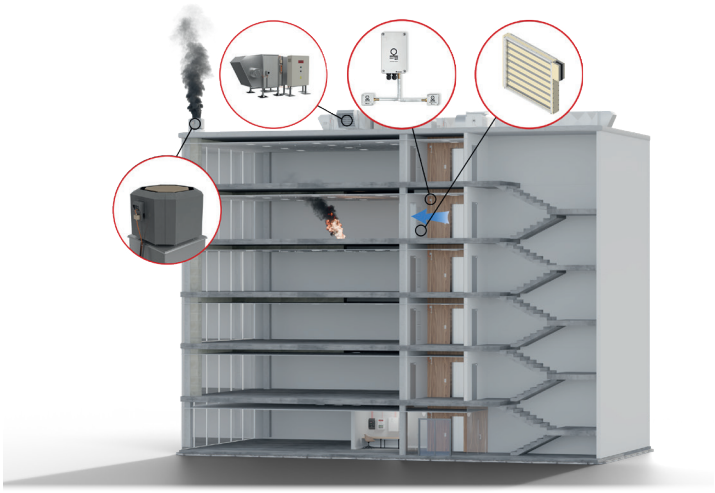
**Fig. 7: Securing fire-fighting lobbies.**
We use pressure sensors or lobby controllers to secure fire-fighting lobbies, depending on the architectural options and the method of smoke removal used on the floor covered by fire. Air is supplied using the mcr EXi-F air supply unit.

**Fig. 7a:** Supplying air to the lobby using the mcr EXi-F unit. Air is extracted through a smoke exhaust window or gravity shaft.



In a building with architecture allowing the use of smoke exhaust windows or gravity shafts to ensure a constant value of differential pressure and the design-required value of airflow through the door, pressure sensors are used on each of the floors. Air is supplied to the lobby using the mcr EXi-F air supply unit

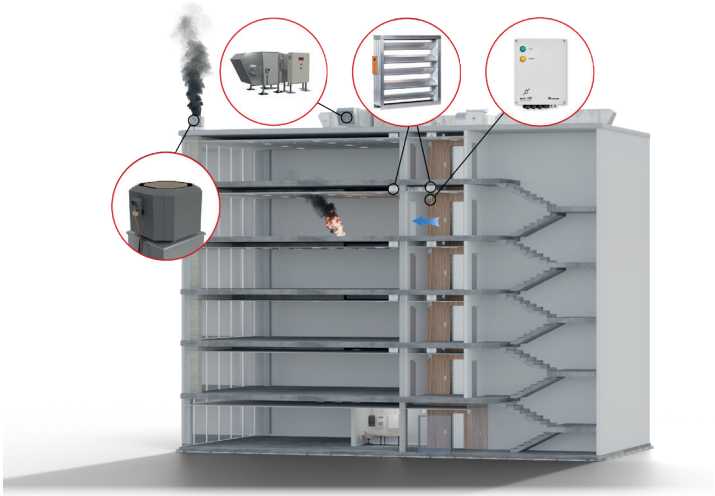
**Fig. 7b:** Supplying air to the lobby using the mcr EXi-F unit. Air is extracted through a smoke exhaust fan using transfer dampers and the differential pressure transmitter.



See video

In the fire-fighting lobby where the architecture allows the use of transfer dampers (compensation for smoke exhaust fans) in order to meet the required design criteria, the differential pressure transmitter should be used on each floor. Air is supplied to the lobby space using the mcr EXi-F air supply unit.

**Fig. 7c:** Supplying air to the lobby using the mcr EXi-F unit. Air is extracted through a smoke exhaust fan using the controller with lobby dampers.



See video

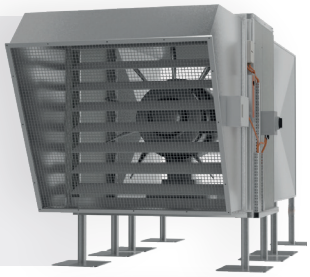
In the case of limited space and the inability to use transfer dampers, a system of high-speed dampers, working with the lobby controller, is used. High-speed dampers control air flow during door opening and closing to ensure a constant pressure difference in the protected space, the design-required air flow speed through the door and compensation for the smoke exhaust fan. Air is supplied to the lobby space using the mcr EXi-F air supply unit.

# COMPONENTS OF THE SYSTEM

## **EXi-F** mcr air supply unit

| HORIZONTAL VERSION

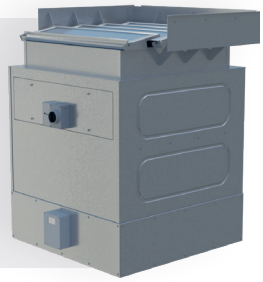
It delivers the design-required amount of air to the protected zone. The unit consists of a fan in an insulated box casing with accessories (e.g. shut-off damper, duct smoke detectors, etc.)



## **EXi-F** mcr air supply unit

| VERTICAL VERSION

It delivers the design-required amount of air to the protected zone. Equipped with a roof base, it allows for installation on a roof curb. Suction side is secured against weather conditions by the mcr LAM louvered vent.



## mcr **Omega**

| CONTROL PANEL

Power supply, control, monitoring and visualization of the operating status of the devices included in the system. Adapted for digital pressure control, it executes the necessary control and regulation procedures for the pressure difference system preventing the accumulation of smoke. Stainless steel or EI90 housing option.

## mcr **ICR Pro**

| POSITIVE PRESSURE REGULATOR

Fan rotational speed is controlled through a three-phase frequency inverter, suitable for DIN-rail mounting with a display for current viewing of system operating parameters and preview of event history.

## mcr **ICS Pro**, mcr **DES**

| DIFFERENTIAL PRESSURE TRANSMITTER

Pressure difference measurement in the protected space. Addressing capability (code setter), auto-calibration, communication between system components is ensured via the mcr BUS. The mcr DES version includes an internal pressure regulator, activated as required by the project. In lobby systems, it is activated by a signal from the SSP.

## mcr **PP**

| PRESSURE MEASUREMENT POINT

Mounted at the terminals of the pressure system, it prevents accidental clogging, eliminating the impact of wind on measurement points. It is supplied complete with the mcr ICS Pro pressure transmitter.

## **BFoot**

| SUPPORTING STRUCTURE

A BIG FOOT quick installation frame is designed for placing the system on flat roofs of buildings. The solution allows to adjust the proper position of the device that rests on it.

## mcr **PSR, PSRc**

| MANUAL CONTROL PANEL

Manual activation or deactivation of the system by persons in charge of the firefighting operation using a key-secured switch. Digital communication (PSRc) in a loop topology allows panels to be installed at any distance from the control panel.

## mcr **WPS** | ELEVATED CONTROL PANEL

An expanded version of the WPS allows for the control of complex systems from a single location, such as a security room. Equipped with a visualization function (HMI panel), it has, among other things, indication of pressure values, viewing of the history of events, information on current errors. Integration with the SSP and BMS.

## mcr **ICP** | LOBBY REGULATOR

Protection of fire-fighting lobbies (control of lobby dampers) without the need for using transfer dampers. Power supply to and control of fire dampers within the security lobby. It is activated by a signal from the SSP.

## **P, PI** | FAN DAMPER

Mounted next to the air supply fan, it prevents cooling of the protected space. In the non-alarm condition, the damper remains in the closed position. Loss of voltage causes the dampers to open (safe position).

## **U2** | DAMPER OF THE TWO INTAKE VENT SYSTEM

The protected space is secured against smoke by two dampers operating in opposite directions. If one damper closes due to the air being contaminated with smoke, the other inlet will provide supply of air required by the system.

## **SRC** | LOBBY DAMPER

Ensuring a constant pressure difference in the protected space, the required speed at the door and compensation for smoke exhaust fans.

## mcr **LAM** | LOUVERED VENT

Air extraction and smoke removal from the building, air intake function for a vertically mounted unit, unsealing of the protected space, air intake vent, installation in horizontal, vertical positions and in sloping roofs.

## **PRE** | DIFFERENTIAL PRESSURE SWITCH

Monitoring the startup of the basic air supply unit. Failure of the basic unit to activate triggers the backup unit system.

## **C, CW, UG** | DUCT SMOKE DETECTORS

Smoke detection in the air supply ducts. In roof-mounted systems, two air inlets (two intake vent system) should be used. Each inlet should be secured by means of an independently operated system of dampers, with a duct smoke detector installed upstream from each damper.

**If smoke is detected, the system automatically shuts down.**

## mcr **SEP1,** mcr **SEP2**

| NETWORK

Prevention of network signal loss in multi-area facilities. mcr SEP1 – for the mcr BUS local network, mcr SEP2 – for the RS485 network.


## mcr **HT**

| ANTI-ICING SYSTEM

Protection of the air supply unit damper from blockage due to icing.


## **KT**

| MAGNETIC SENSORS

Monitoring of door and window opening positions. The reeds monitor the door position and, depending on the control algorithm, trigger or change the performance of additional fans in the system.

## **CT**

| TEMPERATURE TRANSMITTER

Air temperature measurement in the protected space and outside. They are used to determine the air flow direction in reversing systems.

## mcr **RPC**

| PROTECTED SPACE UNSEALING MODULE

It eliminates pressure hikes in sealed protected spaces that occur during evacuation as a result of closing doors.

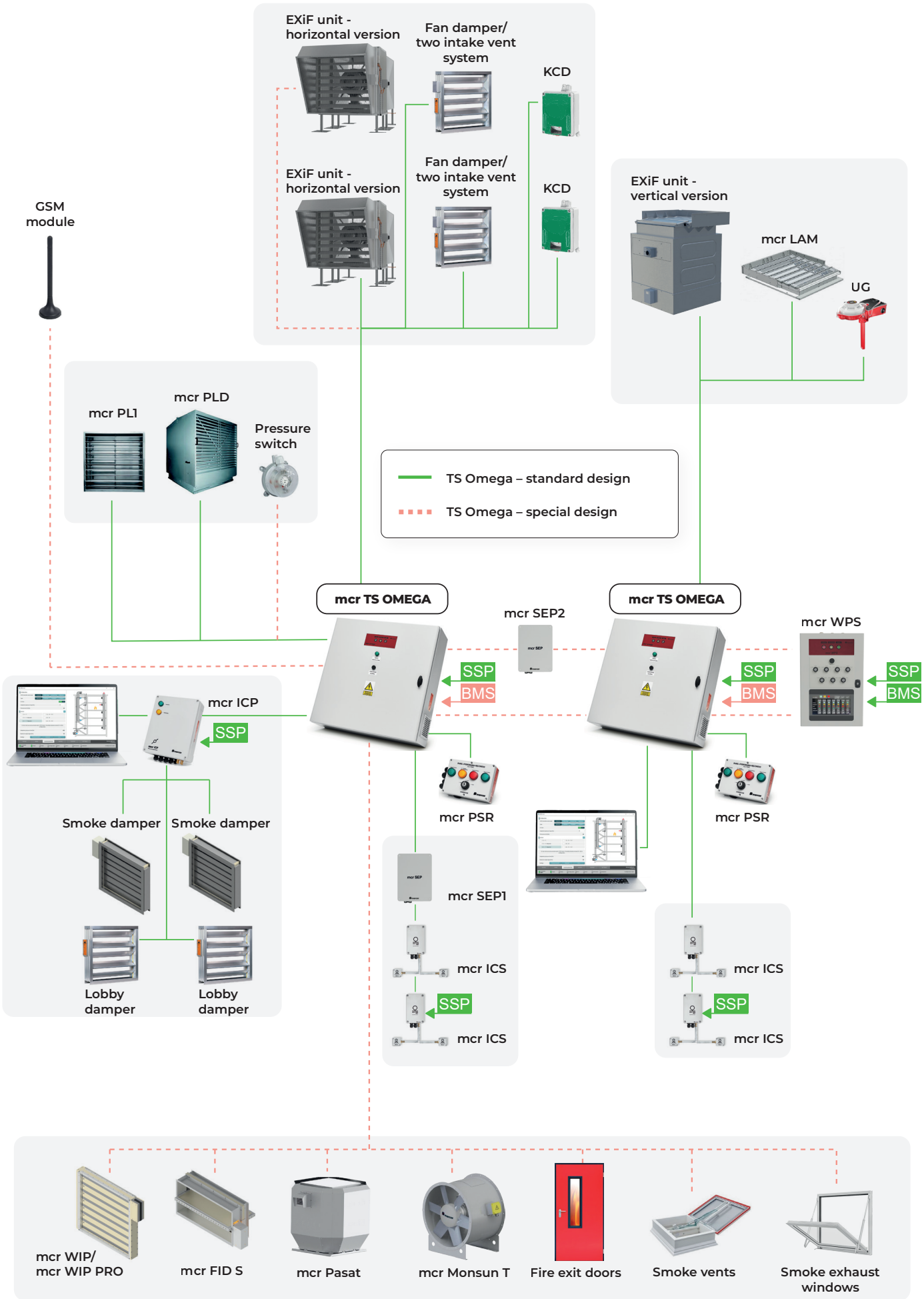
## mcr **PLD,** mcr **PL1 dampers**

Automatic extraction of air from the protected space (tripping threshold adjustment in the range of 20–80 Pa). Used interchangeably with a permanent unsealing, it optimizes the maximum delivery value of the air supply unit.

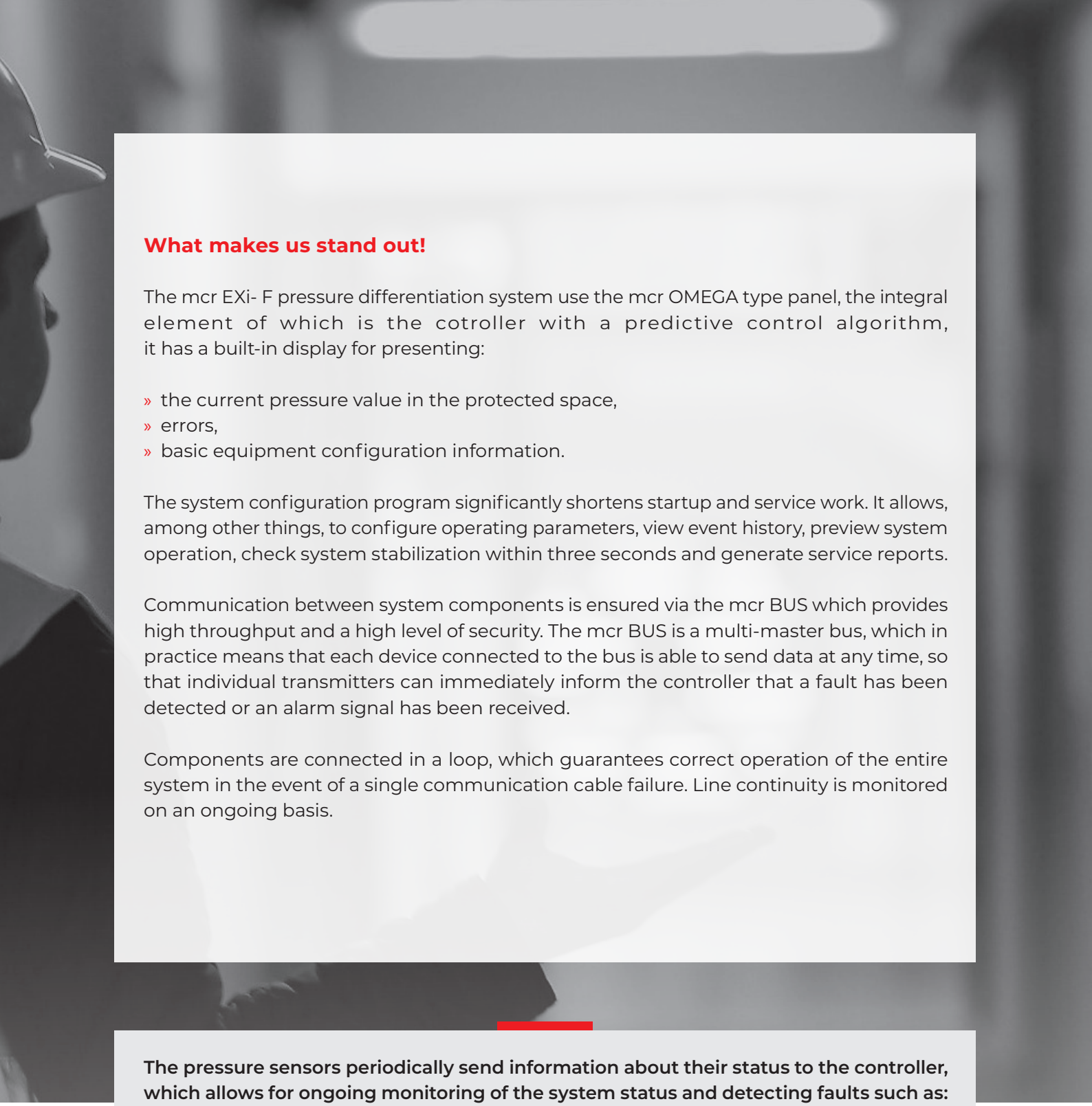
## **GSM** module

Remote control of the system status. It allows, among other things, to configure operating parameters, view event history, preview system operation and generate service reports.

# BLOCK DIAGRAM WITH SYSTEM COMPONENTS




The basic universal design of the TS Omega Panels enables the operation of most systems without expansion. Additionally, a wide range of components included in the system allows for individual configuration of the automation system tailored to theproject assumptions.



## What makes us stand out!

The mcr EXi- F pressure differentiation system use the mcr OMEGA type panel, the integral element of which is the cotroller with a predictive control algorithm, it has a built-in display for presenting:

» the current pressure value in the protected space,
» errors,
» basic equipment configuration information.

The system configuration program significantly shortens startup and service work. It allows, among other things, to configure operating parameters, view event history, preview system operation, check system stabilization within three seconds and generate service reports.

Communication between system components is ensured via the mcr BUS which provides high throughput and a high level of security. The mcr BUS is a multi-master bus, which in practice means that each device connected to the bus is able to send data at any time, so that individual transmitters can immediately inform the controller that a fault has been detected or an alarm signal has been received.

Components are connected in a loop, which guarantees correct operation of the entire system in the event of a single communication cable failure. Line continuity is monitored on an ongoing basis.

**The pressure sensors periodically send information about their status to the controller, which allows for ongoing monitoring of the system status and detecting faults such as:**
» lack of line continuity,
» removal of the digital pressure transmitter or its failure,
» nlack of alarm input continuity,
» failure of the digital pressure sensor.

The mcr ICS pro pressure sensors allow surface mounting with the possibility of aesthetical (invisible) insertion of cables into the device.

**Loss of communication with the active pressure transmitter activates the self control function, setting the fan rotational speed of the air supply unit corresponding to the pressure value (with all doors closed) from the system adaptation process.**

# REFERENCE FACILITIES

Our reference facilities include:

1

2

3

4

1. Brain Park Kraków
2. SkySawa Warsaw
3. Warsaw HUB
4. Hanza Tower Szczecin

## And other selected facilities

- Sea Park Bulvar Gdańsk
- Vena Office Building Warsaw
- Atal Sky+ Warsaw
- Swobodna SPOT Office Building Wrocław
- Campanile Hotel Warsaw
- “Grześ” Student House Lublin
- “Politechnika” Hotel Gdańsk
- Praski Hotel, Warsaw
- Air Traffic Control Tower Mirosławiec
- Baltic Opera Gdańsk
- Gdynia Business Center Gdynia
- Sea Hall Gdańsk Aura Sky Warsaw
- Palace of Culture and Science (PKiN) Warsaw
- Sea park Gdańsk
- Nowy Rynek (New Market Square), building G, H – Poznań
- Spektrum Gdańsk
- Vector Plus office building Warsaw
- DL Tower Katowice Konfartego 183
- Wroclaw University of Science and Technology PWR C-7 Wroclaw
- Light Tower Reda
- Holiday Inn Hotel Warsaw
- Lixa office building Warsaw
- Locum Office Building Bydgoszcz Dworcowa
- Metro stations Warsaw
- Spectrum C, D Gdańsk
- Metropoint Warszawa Grzybowska 85/C
- Musical Theatre Gdynia
- TDT Warsaw
- Court in Elbląg
- Nowa Letnica Housing Estate Gdańsk
- Centrum Orląt Lwowskich Warsaw
- Silesian Hospital Cieszyn
- Solaris dormitory of the Silesian University of Technology Gliwice
- The Park 9 Warsaw
- Catholic University of Lublin
- PHN Tower Warsaw
- Airport Terminal – flight control tower Radom
- Atrium Reduta Warsaw
- The Park B7 Warsaw
- Eternum RWS Gdańsk
- Metropolitan Warsaw
- A&O Hostel Warsaw
- Poznan University of Technology, Faculty of Architecture
- Motel One Warsaw
- Warsaw School od Economics
- Regional Court Warsaw
- Atenor Likeside Warsaw
- Ochota Campus of the University of Warsaw
- Sella Centre Gdynia
- Aparthotel Warsaw
- Teta Office Building Bydgoszcz
- Gemini Park Tychy

**In addition to the facilities mentioned, we have alsocompleted many other projects.**

## Take a look at our full offeravailable at:

**www.mercor.com.pl/en**

## For more information on the EXi-F system, please refer to the operating and maintenance documentation:


**HQ Gdańsk**

ul. Grzegorza z Sanoka 2
80–408 Gdańsk, Poland
(+48) 58 341 42 45
(+48) 58 341 39 85
hw.export@mercor.com.pl